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FRUIT INSECT INVESTIGATIONS

Dispersion flight of turnip aphid.--While walking to work about 8 a. m. on November 19, 1939, E. A. McGregor, of the Whittier, Calif., laboratory, noticed that the air was filled with myriads of winged aphids which were later determined by P. W. Mason, of the Division of Insect Identification, as the turnip aphid (Rhopalosiphum pseudobrassicae (Davis)). Between 8 and 10 a. m., these insects became increasingly abundant, but almost disappeared during midday. Again, in late afternoon, this dispersion flight became very dense and the climax was reached shortly before sunset, when it was estimated that the average interval between aphids was about 2 feet. On this basis there would be 10,890 insects in each 2-foot stratum over an acre of land. This density seemed to exist as high as the eye could discern the aphids, at least to a height of 50 feet. At this rate, there would be 272,250 insects per 50 feet of air over an acre. In the course of a 3-mile trip (from 3:30 to 4:30 p. m.) these aphids were general throughout the area traversed. To attempt to estimate the numbers of aphids within a few miles of Whittier would result in figures beyond one's power of conception. Again, on December 1, while motoring 2 miles west of Pomona, Mr. McGregor encountered myriads of aphids. This migration was so dense as to impair visibility slightly, especially as the aphids were intercepted on the windshield. Mr. McGregor has observed somewhat similar migratory flights of aphids on one or two previous occasions in central California, but these flights were early in the spring. No such fall movement had ever previously been seen by him.

Parasites of Comstock's mealybug established.--Because of the serious damage being caused by Comstock's mealybug (Pseudococcus comstocki Kuw.), in apple orchards in the Eastern States, the Division of Foreign Parasite Introduction arranged for the importation from Japan of several species of parasites of this pest. These were received at the Moorestown, N. J., laboratory and stocks have been maintained by the oriental fruit moth parasite project at that point. During the summer, liberations of these parasites have been made by G. J. Haeussler, in charge of the Charlottesville, Va., laboratory. Surveys recently made have shown that the most promising parasite of the group, a gregarious form of the genus Allotropa, is well established in several orchards in Virginia and West Virginia. From 1 block of trees in each of which 30 parasitized mealybugs were

placed on June 8, 86 mummies per tree were collected on September 3, and these represented only a small proportion of the total number present. Near Martinsburg, W. Va., the mealybugs were found to be 36-percent parasitized by this species 2 months after the initial liberation.

Leafhoppers in vineyards.--Collections made by Perez Simmons, of the Fresno, Calif., laboratory, in Arizona and California in May and June have been identified by P. W. Oman, of the Division of Insect Identification. The dominant species in the San Joaquin Valley, Calif., was Erythroneura elegantula Osb. Several species were found in material taken in vineyards near Phoenix, Ariz., of which the more abundant were Erythroneura variabilis Bean. and Dikraneura cockerelli Gill. Smaller numbers of Empoasca solana Del. and Ollarianus strictus Ball, with a few individuals of several other species, were present.

Ability of *Aphelinus mali* to spread rapidly.--Evidence of the ability of *A. mali* (Hald.) to spread into areas adjacent to points of liberation has been collected by E. J. Newcomer, of the Yakima, Wash., laboratory, and will be published soon in the Journal of Economic Entomology. Additional evidence has recently been obtained. The woolly apple aphid was found to be quite scarce in the Kittitas Valley of Washington and to be parasitized by *A. mali*. This area is about 20 miles from the nearest trees in the Yakima Valley, where the *Aphelinus* was established about 10 years ago, and so far as known, no artificial introduction of the parasite has been made into the Kittitas Valley. An isolated orchard in a canyon between the Kittitas and Yakima Valleys was also examined, and parasitized woolly aphids were found here also. This orchard is 10 or 12 miles from any other orchard and the parasites undoubtedly became established naturally, as the orchard is neglected and artificial introduction would hardly be made under such circumstances.

MEXICAN FRUITFLY CONTROL

Trapping results show seasonal decrease.--The number of *Anastrepha ludens* Loew trapped in Texas decreased from 229 during July to only 9 during August, and instead of flies being trapped in 10 districts, as was done in July, they were taken in only 3 districts in August. The 9 flies trapped were submitted for identification early in August and from that time until the close of the month there was nothing to indicate that fruitflies were present in the regulated area by the first of September. This decrease in numbers of fruitflies is a seasonal occurrence and, unless some unforeseen condition arises, the new crop of fruit should reach maturity without great danger of a fall infestation developing. Throughout the entire lower Rio Grande Valley there was a distinct shortage of rainfall and it was necessary to make repeated irrigations to keep the crop in a good growing condition. As a result of the shortage of rainfall, relatively little progress was made in the development of the new crop. Present indications are that there will be no fruit ready for harvesting until very late in September and probably not until October.

CEREAL AND FORAGE INSECT INVESTIGATIONS

European corn borer in early market sweet corn.--The corn borer caused considerable damage in 1940 to early market sweet corn grown in particular sections of New Jersey, Ohio, and Connecticut. C. A. Clark, Moorestown, N. J., reports a definite trend toward increase in corn borer populations in 1940 over those of 1939 in early sweet corn in Burlington County, N. J. As a result of a survey of 29 fields in the county in each of the 2 years, the average number of borers per plant was determined as 5.1 in 1940, as compared with 4.2 in 1939. The 3 fields in New Jersey having the highest infestation in 1940 averaged 16, 14, and 13 borers per plant, respectively. According to A. M. Vance, Toledo, Ohio, infestation by the corn borer in early sweet corn west of Toledo was less in 1940 than in 1939, averaging 5 borers per plant in 1940 and 8.2 in 1939, on the basis of 25 fields surveyed each year. In New Haven County, Conn., an average of 5 borers per plant was found in 25 fields of early sweet corn surveyed in 1940, representing a striking decrease from the unusually high average of 19.8 borers per plant found in a similar number of fields examined in that section in 1939.

Midsummer pupation of European corn borer in early sweet corn.--A. M. Vance, Toledo, Ohio, reports that pupation of the first generation of the corn borer in early sweet corn west of Toledo in 1940 exceeded that observed in any previous year of record and developed later in the season than in 1939. In 18 fields examined August 7-8, an average of 28.4 percent of the larvae had pupated and 3.8 percent of such pupae had produced moths. These figures are comparable with a midsummer pupation of 11.8 percent, accompanied by a moth emergence of 34.1 percent, observed in 25 fields of early sweet corn in the same locality from August 1 to 5, 1939. In 10 of the 18 fields observed in 1940 pupation averaged more than 30 percent, with a maximum of 45.3 percent in 1 field. The relatively high pupation occurring in 1940 may well have been influenced in part by high temperatures at Toledo during the last 13 days of July, for which period the average daily excess temperature, as compared with normal, was 8° F.

JAPANESE BEETLE CONTROL

New can opener speeds up methyl bromide fumigation.--A commercial can opener made especially for the opening of 1-pound cans of methyl bromide has been adopted for use in connection with the fumigation of refrigerator cars in the Pennsylvania Railroad freight yards at Edge Moor, Del. The device consists of a band of spring steel that fits over the can, a 1/8-inch brass nipple 1 inch long, a pointed, hard steel tube sweated into the nipple for piercing the can, a piece of 1/2-inch rubber tubing, serving as a gasket, and a clamp attachment for forcing the steel tube into the can. The U-shaped copper tubing regularly used with the 15-pound applicator is fastened to the nipple on the can opener and set into the car in the usual manner, so that when a can is pierced the pressure forces the methyl bromide out of the can, thus spraying the contents into the car. It was found necessary to tilt the can toward the pierced end, in order to force all the liquid out. The average time required to empty a can through the size nozzle used is 1 minute. This method of application has many distinct advantages. The cost of methyl bromide in the can is the same as in the large cylinders, but the \$10 deposit on each cylinder is eliminated. There is no heavy cylinder to return and there is no expense for charging

the cylinder with air. The railroad estimates that they save approximately \$25 per day at the Edge Moor yards by eliminating the mechanics required for filling and repairing the applicators. There is a considerable saving of time in fumigating a long string of cars. Finally, use of the cans permits an exact dosage in each car. During August, 29 cars were fumigated by this method in $1\frac{1}{2}$ hours, as compared with the average of 15 to 18 cars per hour with the 15-pound applicator. The $1\frac{1}{2}$ hours of elapsed time included at least $\frac{1}{2}$ hour's delay, owing to a demonstration on the first car and time consumed in adjusting, checking, and testing the applicators. Under ordinary circumstances the 29 cars could have been fumigated in an hour. Several minor adjustments were noted for correction and the correct position of the can necessary for quick and complete emptying of its contents was observed. The railroad officials are satisfied with the results and are well enough acquainted with the procedure to begin next season using the 1-pound cans exclusively.

Fumigation tests with packaged perennials.--A large nursery in Ohio started this month to fumigate perennials in compliance with the Japanese beetle quarantine regulations. In order to facilitate quick handling of their shipping orders, they requested that tests be run to determine the possibility of fumigation of perennial plants in the wrapped packages just prior to mailing. Tests have been made with the perennial plants in their wrappings and placed in open-topped shipping boxes. Most of the closed and sealed packages have a set of air holes at one or both ends of the boxes, plus extra holes punched in the boxes to regulate the amount of ventilation. Tests were made with grubs in packages with varying numbers of holes. No difficulty was encountered in securing the penetration of gas necessary to effect a complete kill of larvae throughout the entire package. The gas apparently penetrates and is retained for a longer period in the package, giving a quicker kill than would ordinarily be obtained with bare-rooted material. It is still necessary for the nursery to determine the effect of the fumigant on the plants, as this retention of gas may have some influence on their growth. If this procedure proves mutually satisfactory it will greatly facilitate the movement of material from this establishment during the spring rush, by eliminating all the tedious handling of small plants to assure that they are free from soil.

Japanese beetle feeding.--Feeding damage was fairly heavy in the Westchester and Long Island, N. Y., areas. On the private estates from which cut flowers were shipped under certification, infestations were general and many of the gardeners set out traps in an attempt to cut down damage to flowering plants. Numerous beetles were removed from cut flowers inspected at these estates. The usual balling of beetles on apples was prevalent in the Bridgeton area of southern New Jersey, while in central Jersey it was reported that crows and blackbirds picking at the ripening fruit were the means of attracting large quantities of beetles that fed on the bruised portion. The birds were therefore indirectly responsible for heavy beetle infestation in some of the apple orchards in the vicinity of Penns Neck, just north of Trenton. Farms in Lancaster County, Pa., reported heavy damage by Japanese beetles to their corn crop. Many growers stated that they would harvest only half a crop. One farmer said that he would not attempt to pick the corn but would turn the entire crop into ensilage.

August fumigation activities.--Fumigation of farm products continued during the month but not on as large a scale as at the beginning of the farm-products-inspection season. Two hundred and eighty refrigerator cars loaded with produce were fumigated with methyl bromide and 2,567 empty refrigerator cars were fumigated with hydrocyanic-acid gas. At Trenton, N. J., 154 cars were fumigated for the Pennsylvania Railroad. Most of these were cars shipped by the Surplus Commodities Commission. The first string of cars at Trenton was fumigated at night under difficult and hazardous conditions. Arrangements were made by the railroad with the Surplus Commodities Commission to fumigate during daylight hours, a more convenient arrangement for all concerned. There was a definite increase in the number of plants fumigated with methyl bromide this month, a total of 125,327 having been so handled. Over 100,000 of these were iris roots. There were no new fumigation chambers constructed during the month, but several nurseries indicated their intention to build chambers in the near future.

Beetle scouting terminated.--Regular scouting of classified nurseries and greenhouses was completed in Delaware on August 17 and on the Eastern Shore of Maryland and Virginia on August 21. Scouting of classified establishments in the Panhandle of West Virginia was completed on August 17 and the scouts were transferred to western Pennsylvania to assist in completion of scouting in that area, so that as much territory as possible could be covered before withdrawal of the scouts paid by the State of Pennsylvania. State men discontinued their scouting in the western part of the State on August 27 and the remainder of the scouting in that section was completed by Federal men. Scouting in the Philadelphia and New York City area continued until August 31. Further scouting in that district was carried on by regular staff inspectors as time permitted in order to complete the scouting schedule, which was delayed somewhat because of rainy weather at the beginning of the season.

Soil treatments at isolated infestations.--Soil treatments in St. Louis, Mo., which were started in July, continued until August 26, a grand total of 17.6 acres being covered in the city. Further treatments there will be made later in the year. At Chicago 2.8 acres was treated on August 30, with the operations continuing into September. Lead arsenate applications in Atlanta, Ga., began on August 14 and 13.6 acres had been covered by the end of the month. Here also the treatments continued into the next month. At Chamblee, Ga., 5.4 acres was treated during August, and at East Point, a suburb of Atlanta, 3.6 acres was treated between August 26 and 31, with additional work to be completed in September. A total of 33.2 acres was treated at these points during the month.

Pittsburgh wholesale dealer in cut flowers starts refrigerator truck delivery.--One of the large wholesalers of cut flowers in Pittsburgh inaugurated during August a refrigerator-truck service from Pittsburgh to florists in outlying cities and towns. Two trucks were loaded at 7 a. m. on Monday, Wednesday, and Friday of each week. The entire loads were inspected and certified, thereby permitting the company's representative to deliver certified cut flowers to classified dealers throughout the tri-State area served from Pittsburgh. Retail trade in the Pittsburgh area was reported as greatly improved. The steel mills there were operating at about 85-percent capacity, the greatest activity since 1929.

Navy Department circularizes naval air fields concerning spread of beetles by airplanes.--At the request of the Secretary of Agriculture, the Acting Secretary of the Navy sent a circular letter to all naval stations within the Japanese beetle regulated area directing that all naval aircraft operating from fields located in the Middle Atlantic States from Norfolk to Connecticut be carefully inspected to assure removal of all Japanese beetles from airplanes prior to taking off. Attention was called to the fact that frequently passengers transport these pests on luggage or other articles. Thorough cooperation with this Department was urged.

Beetle infests imported log on its arrival.--An inspector of the Division of Foreign Plant Quarantines at the Port of New York reported to the New York City Japanese beetle supervisor that on August 14 an adult Japanese beetle was found beneath the bark of a lignum-vitae log from Guatemala. The log had been transported on the deck of a ship that had lain at Quarantine in New York Harbor for about an hour. Beetles were in heavy flight early in August in the Narrows of New York Bay, where the quarantine station is located. Undoubtedly it was at this point that the beetle crawled beneath the bark of the log.

Boat held while refrigerator cars fumigated.--Ordinarily fruits and vegetables traveling via boat do not require certification under the Japanese beetle regulations. However, an exception was encountered during August when an urgent call was received for the fumigation of three refrigerator carloads of potatoes from the heavily infested section of New Jersey to be shipped via sea train to Southern ports. The work was performed under emergency conditions and as soon as the cars were released they were run aboard the sea train and the boat pulled out.

Heavily leaded soil replaced.--A New Jersey nursery started work in August on the removal of 9 inches of top soil from approximately half of their extensive areas treated with lead arsenate. This soil is of high lead arsenate content, owing to repeated applications of this chemical at the rate of 1,500 pounds per acre. These annual applications were far in excess of any required by the Japanese beetle quarantine regulations. This soil is being replaced with virgin top soil obtained from nearby farms.

Gypsy moth certification activities.--More than 2,600,000 board feet of lumber was certified in the Portland, Maine, district for shipment to points outside the generally infested gypsy moth area in August. This was the largest quantity of lumber certified in that section during any month in the past 3 years. Much of this material will be used for crating articles for export. At Brockton, Mass., an egg cluster was removed from a hemlock twig which was to be used on a funeral piece consigned to a point outside the regulated area. Stages of the gypsy moth removed from 57 lots of infested material presented for inspection during August numbered 360 egg clusters, 217 larvae, and 442 pupae.

Records of infested shipments reflect heavier oviposition.--From a total of 117 infested shipments presented for inspection during July and August 1940 there were creosoted and removed 362 egg clusters, 563 larvae, and 589 pupae of the gypsy moth. This compares with 46 egg clusters, 168 larvae, and 129 pupae removed from 31 infested shipments inspected in the

same period the preceding year. The egg-laying season of the moth was nearly completed in August, although 1 living gypsy moth pupa was observed in Hartford, Conn., as late as August 30. Reports from district inspectors indicate that there are unusually heavy deposits of egg clusters in southern Maine, central and southern New Hampshire, and central and eastern Massachusetts.

Dutch elm disease infections in isolated areas.--Discovery of additional trees infected with Ceratostomella ulmi in Broome County, N. Y., area extended that area to the north, east, and south. The townships involved in this infection cover about 325 square miles, including the eastern half of Broome County and the northeastern corner of Chenango County. A confirmation near Hancock will extend the area into Delaware County. One tree in Susquehanna County, Pa., above Lanesboro, is also a part of this area. Another Pennsylvania tree in Wayne County, opposite Hancock, may prove to be an extension of the area. With the exception of a group of about 20 infected trees along State Route 235 between Nineveh and Coventry, infected trees in this area are generally scattered. No Scolytus multistriatus Marsh. beetles have been associated with the infection, although there are many dead elms in the area. The Wilkes-Barre, Pa., disease area, on the basis of limited information at this time, shows many contrasts to the Broome County area. The diseased trees are largely located in 1 center in the city, where elms have been weakened by a new dike along the Susquehanna River. S. multistriatus infestations are very heavy in this area and have been found south and west in the Susquehanna Valley. Native elms in this section are generally confined to streams and there are not the numerous dead elms that may be found in Broome County.

Dutch elm disease scouting outside the main area.--During August six confirmations were reported from the outside area--two from Indiana and four from Ohio. In several sections of the Maryland work area there was a noticeable increase this season of S. multistriatus. Throughout the other sections of the work area very few beetles of this species have been found. This trend of beetle infestation pointed to the probability that there was a source farther east from which these beetles were spreading. Advance survey scouting was accordingly started at the Pennsylvania State line and progressed south toward the Potomac River. In this section enough evidence in the nature of old engravings and currently infested material was found in girdled trees to indicate that at least some of the trouble was coming from the suspected section. The first go-over of suspect scouting was completed in the Maryland work area and in the major Athens, Ohio, zone. Scouting in Ohio was slowed up somewhat on the second survey, owing to elms showing considerably more yellowing, caused principally by an extremely dry spell.

Insect damage interferes with Dutch elm disease scouting.--Dutch elm disease scout crews in New York reported that considerable damage was done to elm trees in the work area by Japanese beetles, resulting in as much as 50-percent defoliation in some localities. Much bark-beetle-infested material was also found and tagged in sections of several counties that were not covered by crews removing ice-storm damage. Injury by the elm leaf beetle was so severe in many sections that it was impossible to spot trees infected with the Dutch elm disease. Many of the elms that were fed upon

early in the season by elm leaf beetles were putting out their second crop of leaves; however, yellowing of elm foliage was appearing generally throughout the New York work area.

Progress of Dutch elm disease scouting.--The first suspect scouting was completed in New York on August 24 and in Connecticut and New Jersey on August 31. Scouting in Pennsylvania was only 85-percent complete because of the delay in starting W. P. A. men. A large part of the New York disease area had to be removed from the 1940 objective for the first-suspect survey because the Works Progress Administration would not approve scout classification. Although the objective of 3,165 square miles was almost completed, only about half of the entire disease and border-zone-scouting area was scouted for diseased trees.

FOREST INSECT INVESTIGATIONS

Larval disease controls spruce sawfly infestations in southern Vermont and New Hampshire.--P. B. Dowden, New Haven, Conn., reports as follows on the status of the European spruce sawfly in southern Vermont and New Hampshire: "There has been practically no feeding by European spruce sawfly larvae in the Wilmington, Vt., and Dublin, N. H., areas in 1940. First-generation larvae apparently suffered such severe mortality from disease that only a few cocoons were formed. On the outskirts of the former heavily infested areas light deposits of frass have been noted at a few places and small numbers of second-generation larvae may be beaten off the trees."

One introduced pine sawfly suffers in competition with another.--C. L. Griswold, of the Morristown, N. J., laboratory, submits the following note concerning competition between two introduced pine sawflies, Neodiprion sertifer (Geoff.) and Acantholyda erythrocephala (L.), when they occur on the same tree: "In 1939 it was decided to make some observations on the extent of injury suffered by infested trees. Accordingly, 3 isolated plantations of pine located in Mendham Township, N. J., which were infested by both species, were selected in the spring of that year. All trees which had been completely defoliated in 1938 by either or both species were tagged for future observation. Only 27 such trees could be found and, of these, 25 had been defoliated by A. erythrocephala and 2 by N. sertifer. Observations made in the 3 plantations indicated that in 1938 A. erythrocephala was the dominant sawfly species and was widely distributed and responsible for nearly all of the defoliation, and that N. sertifer seemed to have reached the areas only recently. The 27 tagged trees were subsequently examined in 1939 and 1940 at the end of the larval-feeding period of both sawflies. These examinations revealed that the N. sertifer population increased at a much more rapid rate than did that of A. erythrocephala. The 1940 examination disclosed that the extent and degree of defoliation by N. sertifer was sharply increased, while that of A. erythrocephala showed a correspondingly sharp decrease. This was due principally to the fact that N. sertifer eggs hatch considerably earlier than those of A. erythrocephala, giving the former a distinct advantage when both species occur together and frequently resulting in the starvation of the larvae of A. erythrocephala."

Pales weevil injury to white pine seedlings in hurricane-swept areas.--H. A. Bess, New Haven, Conn., reports as follows on observations made in August to determine the extent of damage to white pine seedlings by the Pales weevil in areas where large numbers of white pines were blown down during the hurricane of September 21, 1938: "A few quantitative data on the injury to natural pine seedlings in hurricane-felled pine stands during 1940 have recently been obtained. In many of these areas 1- to 3-year-old seedlings are fairly abundant and in some small localized spots there are a number of conspicuous dead seedlings resulting from Pales weevil injury. However, these recent examinations indicate that there was comparatively little mortality this year from Pales weevil injury in three of the four areas studied. About one-half of the seedlings examined in the fourth area were dead.

Studies of elm insects as possible vectors of phloem necrosis.--D. E. Parker, Columbus, Ohio, reports that the large number of elms dying from this disease in and around Columbus afford very suitable conditions for the development of large numbers of the small European elm bark beetle (Scolytus multistriatus). Some elms killed by the phloem necrosis disease appear to dry out too rapidly for successful development of a brood of beetles, but many remain in suitable condition and are heavily attacked. Dead and dying trees have not been removed promptly, giving ample opportunity for an increasingly large population of bark beetles. Saperda tridentata Oliv. is commonly found developing in the diseased trees, as are also broods of Magdalis spp.

GYPSY MOTH AND BROWN-TAIL MOTH CONTROL

Gypsy moth infestations reduced by climatic conditions.--Field observations made throughout the spring and summer months in much of the New England area where gypsy moth work is carried on clearly indicate that there has been a heavy mortality of gypsy moth caterpillars since hatching time last spring and, as a result, fewer larvae than normal have reached maturity. Temperatures below freezing prevailed for long periods during the winter months, but it was not sufficiently cold in most localities to cause winter killing of the eggs and the spring hatch was about normal, although the hatching was delayed considerably because of the cold weather. Continued unseasonably low temperatures in May retarded the development of foliage to a marked degree, resulting in a definite scarcity of food for the newly hatched caterpillars. These unusual conditions were augmented by a sudden drop in temperature on June 20, accompanied by a severe frost which necessitated the replanting of many crops, and a fall of snow late in June throughout the mountainous sections of New Hampshire, Vermont, and in several towns in Berkshire County, Mass. These abnormal climatic conditions explain, to a large extent, the heavy mortality of the gypsy moth larvae. The abnormality of the season is exemplified by the fact that scouting crews working in Massachusetts were still finding all stages of the gypsy moth at infestations during the week ended August 24, although only a small number were still in the larval stage.

Gypsy moth work hampered by delay in filling requisitions.--Up to the middle of August it had not been possible to obtain the full force of W. P. A. workers provided in the project applications for the first 8 months

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of the new fiscal year. Only about 50 percent of the force needed to complete the work program had been assigned in the States of Vermont and New York, and many additional workers were needed in Pennsylvania. Owing to the delay in starting the projects, many of the former gypsy moth employees were assigned to other W. P. A. projects or had found employment in private industry. It is possible that this situation may be somewhat alleviated in the future by the reassignment of some of the former workers to the gypsy moth projects, but the prospect for obtaining a full quota appears slight.

Definite work plans based on early preliminary scouting.--Early in August a small amount of preliminary scouting work was started in several selected townships in the barrier zone section of Connecticut, in order to determine the presence and density of infestation of the gypsy moth in those areas. This work was started early in the season so that a definite plan for intensive scouting and subsequent treatment work could be drawn up by the time the egg deposition had been completed.

Spraying equipment cleaned and reconditioned.--The work of cleaning spraying apparatus used in the States of Vermont, Massachusetts, and New York during the last spraying season was completed early in August at the storehouse in Greenfield, Mass. The men who were employed on this work are now engaged in cleaning, repairing, and redressing oiled hats and coats used in gypsy moth spraying work, and also in assorting and repairing the various field tools used last season so that they may be reconditioned for reissuance or condemned as unfit for further use.

Wet brush piles quickly ignited by the use of waste materials.--An efficient and economical method of burning rain-soaked or snow-covered brush, that can be used wherever a supply of old rags or other waste material of a similar nature is available, has been used for some time in burning brush and forest debris accumulated in the course of selective thinning and cleaning operations by gypsy moth crews. Most of the burlap bands used for trapping gypsy moth caterpillars at infested sites are unfit for further use when they are removed from the trees at the end of the larval season. These bands are stored temporarily for reissuance, together with accumulated old crankcase oil, when the ground conditions become favorable for burning brush. As much of the brush must be burned after rainstorms or snowstorms to eliminate the danger of starting forest fires, it is often difficult to start the brush burning without the use of some inflammable substance. The used burlap soaked in the old oil develops an intense heat which dries the brush sufficiently to start the burning process immediately, when properly placed in the piles. The use of this method of starting fires under adverse conditions has enabled gypsy moth crews to burn the accumulated brush rapidly and efficiently, using materials that would otherwise be discarded.

Scouting work progresses in difficult sections in northern Vermont.--The progress of gypsy moth scouting work in Orleans and Lamoille Counties, Vt., has been slow during the last few weeks, as the crews are working in rough mountainous areas, where the ledgy and precipitious slopes are still littered with a tangle of timber blown down by the 1938 hurricane, and also by dense growths of underbrush. A considerable percentage of the down and lodged trees are still alive, as the roots are only partially torn

from the ground. The living treetops, mingled with the understory of shrubs and smaller trees, form an almost impenetrable thicket which is extremely difficult to examine satisfactorily. Blackflies, mosquitoes, and other biting insects, which appear to be particularly abundant this year, added to the discomfort of the workers. As a partial offset to these unfavorable scouting conditions, many of the mountain streams have dried up to such an extent that the crews can easily cross the stream beds. Rainfall in northern Vermont has been very light for several weeks and even the larger streams in the lowlands are abnormally low for this season of the year.

Stowe, Vt., apparently remains uninfested by gypsy moth.--In addition to the intensive examination of all tree growth and ground litter within a wide radius of the tree where a gypsy moth caterpillar was found late in July in Stowe Township, Lamoille County, Vt., approximately 90 burlap bands were attached to trees in that vicinity. The bands were patrolled regularly, but no caterpillars were found beneath them. As the intensive scouting work also produced negative results, it would appear that the caterpillar that was discovered had become established as a result of the wind dispersion in the spring. The discovery of this particular caterpillar was especially important because no gypsy moth infestation had been found in Stowe since 1923.

Burlap bands removed from trees in Vermont.--The patrolling of burlap bands continued until the middle of August in Vermont. Approximately equal numbers of gypsy moth larvae and pupae were being found during the first few days in the month and a marked reduction in the number of larvae found, as compared with previous weeks, was noted during the following week. As the development of the insect had progressed so far by the middle of the month that very few were found beneath the bands, this work was discontinued at most of the infested sites, and the burlap removed from the trees.

Exposed infestation found in Massachusetts near New York State line.--A gypsy moth infestation was located in an exposed site at a high elevation on a mountain ridge in Hancock Township, Berkshire County, Mass., late in August. This infestation overlooks rugged country in nearby New York State, and conditions are particularly favorable for westward wind spread from this point. Every effort will be made to exterminate this infestation when conditions are favorable for treatment work.

Pupal and egg cluster infestations found in Connecticut.--Scouting crews working in the township of Litchfield, Litchfield County, Conn., located several gypsy moth infestations, consisting chiefly of pupae, during the latter part of August. Because of their inconspicuous color, pupal infestations are much more difficult to discern in the dense forests than the buff-colored egg clusters. Crews of laborers engaged in the removal of sprouts and in other ground work at locations found to be infested during the fiscal year 1940 found a small number of new egg clusters. Most of these egg clusters were discovered at infestations where no spraying was done last season.

Sawdust machine disposes of large accumulation of brush.--The sawdust machine developed by this activity, which reduces brush and limbs to sawdust

and either blows the sawdust into piles or distributes it over a wide area, is being used in a section of Hartford County, Conn., where 430 piles of brush have accumulated since last spring as a result of gypsy moth thinning work. The machine is able to dispose of only about 20 piles each day, as the brush is largely hardwood, is nearly dry, and contains many large limbs. At the present rate of progress the work in this area will not be completed until the first part of September.

Delay in authorizing W. P. A. work in Pennsylvania reduces benefits expected from banding.--W. P. A. gypsy moth field work, which was suspended at the end of June, was resumed in the Pennsylvania area on August 12, the earliest date possible after authority to commence work was received at this office. Very little benefit will be derived from burlap bands applied to trees in this area last spring, because of the delay in starting this project. Some of the bands were patrolled regularly by N. Y. A. workers detailed to this project and many of the insects were killed by them, but the scope of their operations was limited by the regulation that N. Y. A. workers can be required to walk only $2\frac{1}{2}$ miles from their assembly point to the actual site of the work project. It is extremely unfortunate that all the burlap bands that were applied could not have been turned regularly, especially in an area where eradication work is being done, as this method of control has proved to be very satisfactory in reducing the gypsy moth population in infested territory. There have been numerous instances where complete eradication of the infestation has been accomplished by the use of burlap bands supplemented by the creosoting of the egg clusters. As the female moths have deposited their egg clusters on some of the bands in the Pennsylvania area, extra care must be exercised in the removal of the bands. The egg clusters must be thoroughly creosoted before the bands are removed so that no portions of live broken clusters can fall to the ground, where they would be covered with snow and protected from low winter temperatures.

Heavy defoliation noted in Vermont.--Reports from C. C. C. gypsy moth foremen in Vermont show that heavy defoliation has occurred in areas in the townships of Rockingham, Westminster, Springfield, and Putney. The defoliation in this area ranges from 25 to 100 percent. The caterpillars were present in the field much later in the season than usual and a crew patrolling burlap bands in a Massachusetts town reported finding gypsy moth caterpillars and pupae in the proportion of two pupae to each caterpillar as late as August 13.

C. C. C. gypsy moth work explained to property owners.--In conformity with the C. C. C. policy of soliciting the cooperation of the property owners in gypsy moth control work, late reports from gypsy moth foremen show that a large number of the owners have recently been taken to areas where work was in progress and the methods were explained to them. The property owners always appear interested in the work, and many of them are sufficiently impressed to plan similar work on their own properties. One of these property owners is planning on planting approximately 10 acres with red pine, which is not a favored food plant of the gypsy moth, at the site of one of the gypsy moth infestations where selective thinning work has been done by the C. C. C.

PLANT DISEASE CONTROL

1940 season unfavorable for rust spread in sugar pine region.--Scouting results thus far this season have been negative aside from the pine infections found in several places where Ribes infections were heavy 2 years ago. An important development was the discovery of two infected sugar pines along Bailey Creek near Viola, on the Lassen National Forest. The pines were located in the general vicinity of the Ribes infections found there in 1938 and were found by H. G. Lachmund. This infection places the southern known limits of pine infection in California approximately 107 miles south of the Oregon border. Judging from negative scouting results to date insofar as new infections on Ribes are concerned, this year, like last, is unfavorable for long-distance spread of infection from the pine infection centers in the North. Although the scouts have located numerous rust infections on Ribes, all thus far have been identified by the Division of Forest Pathology as pinyon rust. Infections of pinyon rust on Ribes seem to be unusually well developed and distributed this year. Eradication crews on the Eldorado National Forest are turning in an abundance of Ribes infected with this rust. In view of the negative scouting results, plus the fact that Ribes defoliation is already becoming pronounced, it is planned to terminate the scouting season by the end of September.

New blister rust control film.--Field work has just been completed in obtaining motion pictures of various phases of blister rust and its control in the Northeastern States. Both black-and-white and colored films were used in taking the 247 scenes. A sound track with narration will be added at Washington. When completed the picture will be issued by the Extension Service of the Department.

Ribes curvatum susceptible to blister rust.--A recent examination by H. E. Yost of an experimental planting of Ribes curvatum near Deep Creek Lake in western Maryland showed heavy infection, thus proving conclusively that this species is susceptible to the white pine blister rust. The test was made because R. curvatum, being native in the southern Cumberland Mountains, had never before been exposed to natural infection out of doors, although it had proved susceptible in greenhouse tests. These bushes were somewhat slower in leafing out than were the native R. rotundifolium, owing to their having been heeled in for some time prior to planting. At least 95 percent of the leaves on these bushes showed blister rust in either the telial or uredinial stages. A few of the rather heavily infected leaves were dying. Many of the nearby R. rotundifolium bushes were practically defoliated because of the extremely heavy infection. Earlier in the season the infection on the R. curvatum plants, caused by aeciospores, was fairly light, as they did not leaf out until toward the end of the period during which aeciospores are produced. This species appears to be highly susceptible to urediospores, since the leaves which appeared on the new growth were heavily infected. Many of these bushes made excellent growth during the summer, in some cases up to 1 foot of new wood. The trial plants are being destroyed before they have an opportunity to fruit, to avoid danger of their becoming established in Maryland.

Severe damage to merchantable-sized white pine at Tupper Lake.--Harry Holcomb, district blister rust control leader at Malone, N. Y.,

recently reported that merchantable-sized white pine in a $7\frac{1}{2}$ -acre stand at Tupper Lake, N. Y., had been damaged severely by blister rust. About three-fourths of the trees are infected with stem cankers and many large pines are dying or dead. Discolored and dead tops are very conspicuous. Most of the cankers are high up on the trunks, which for the most part are free of lower branches. The infection was apparently spread by skunk currants. It is planned to make a damage study in this area.

Fungus causing defoliation of ribes identified.--A fungus which has been causing defoliation of skunk currants in Worcester County, Mass., has been identified by Perley Spaulding as Pseudopeziza ribis. This fungus apparently is not new, but it is causing premature defoliation and was noted as early as the last week in July.

First report of blister rust in five West Virginia counties.--Extensive scouting was carried on in West Virginia in August for blister rust and the disease was found on wild and cultivated Ribes in the uredinial and telial stages in 4 counties--Grant, Mineral, Morgan, and Berkeley--and on both Ribes and white pine in Hampshire County. The infection on Ribes in most cases was light, the species infected being R. cynosbati, R. rotundifolium, R. aureum, and R. grossularia. In Hampshire County, out of about 15 to 20 young white pine trees examined, only 1 was found to be infected. The only canker found appeared to be of 1934 origin. No blister rust infection, either on Ribes or white pine, has previously been reported in the above-mentioned counties.

COTTON INSECT INVESTIGATIONS

Early destruction of cotton stalks reduces boll weevil population.--The cotton stalks throughout the lower Rio Grande Valley were destroyed early in 1939 as part of the control program against the pink bollworm. In general, the fields in the Brownsville area, on this side of the river, were cleaned up earlier than the fields in the Matamoros area in Mexico. R. L. McGarr and F. F. Bibby examined cotton last May to determine the effect on the boll weevil population of early destruction of cotton stalks in 1939. The boll weevil infestation was low in both areas and many fields on both sides of the river showed no boll weevil infestation. On the Brownsville side the examination of 19,200 squares in 116 fields gave an average infestation of 1.34 percent, while on the Mexican side, where the stalks were not destroyed quite so early last fall, the examination of 18,000 squares in 109 fields gave an average infestation of 3.62 percent. The highest infestations found on the American side during each of 5 successive weeks ending May 4, 11, 18, and 25 and June 1 was 5.0, 4.5, 4.0, 3.5, and 16.5 percent, while on the Mexican side of the river the highest infestations for these 5 weeks were 10.0, 26.5, 28.0, 19.0, and 25.5 percent. Average highest weekly infestation on this side of the river for 5 weeks was 6.7 percent, while on the Mexican side it was 21.8 percent. In contrast with these low boll weevil infestations in 1940, records made in this area by the Division of Pink Bollworm and Thurberia Weevil Control in March 1939 show that on the American side the inspection of 17,824 fruiting forms showed a boll weevil infestation of 20 percent and on the Mexican side the examination of 9,714 forms showed that 33 percent were infested. Although the season is several weeks later this year than in 1939,

these studies emphasize the value of early fall destruction of cotton stalks as a means of boll weevil control.

Mixtures of calcium arsenate and nicotine sulfate for boll weevil and cotton aphid control.--K. P. Ewing and assistants at Waco, Tex., report that in 1 of the boll weevil-aphid control experiments the aphid infestation was high enough to give interesting results. The plots used were 1/18-acre in size and were arranged in randomized blocks with 4 replications of each treatment as follows: (1) Check (untreated); (2) calcium arsenate; (3) calcium arsenate plus 0.5 percent nicotine sulfate; (4) calcium arsenate plus 1.0 percent nicotine sulfate. Each treated plot received eight applications of dust, averaging slightly less than 6 pounds per acre-application. Although there was never a damaging infestation of aphids in any of the plots, for the first 2 weeks in August the population ranged from 11 to 14 aphids per square inch in the calcium arsenate treated plots of blocks 1 and 2. A comparison of the average aphid infestation in the different treatments of blocks 1 and 2 at the peak period of the infestation, on August 6 and 13, is as follows:

<u>Treatment</u>	<u>Average aphids per</u>
	<u>square inch</u>
	<u>Number</u>
Calcium arsenate-----	12.64
Calcium arsenate plus 0.5 percent nicotine sulfate---	3.67
Calcium arsenate plus 1.0 percent nicotine sulfate---	.31
Check-----	.13

These records show 3.4 times as many aphids in the calcium arsenate treated plots as in the plots treated with calcium arsenate plus 0.5 percent nicotine sulfate and 40 times as many in the calcium arsenate treated plots as in the plots treated with calcium arsenate plus 1.0 percent nicotine sulfate. These records show definitely that in this particular experiment 0.5 percent nicotine sulfate gave good control or held the aphids well below the damage point and that there were practically no aphids in the plots treated with 1.0 percent nicotine sulfate. In view of the fact that the aphid infestation in the calcium arsenate treated plots did not quite reach the damage point, average maximum of only 12.64 aphids per square inch during a 2-week period, and that only 1 such experiment was conducted, the results would not justify definite conclusions. Results of the experiment do, however, indicate what might be expected from similar treatments conducted on a larger scale, and they do bring to light certain important questions that must be investigated.

Dusting versus spraying for boll weevil control.--K. P. Ewing and seasonal assistants at Waco report regarding three sets of experiments for boll weevil control, conducted in Limestone County, Tex. In each experiment four plots (2 acres per plot) received the following treatment: (1) Check (untreated); (2) calcium arsenate dust, 7 to 8 pounds per acre; (3) calcium arsenate spray, 7 to 8 pounds per acre; (4) lead arsenate spray, 2.5 pounds per acre. The poisoned plots in each experiment received five effective applications at about 5-day intervals between July 9 and July 31. The dust applications were made between daylight and 8 a. m. The spray applications were made later on the same days. The

accompanying table summarizes the average boll weevil infestation records made in each plot on July 8 (before poison was applied), and on July 15, 22, 29, and August 7, and the bloom counts made on July 25, August 1, and August 7. From the infestation records and bloom counts, it is evident that calcium arsenate dust gave much better control than either of the sprays, with calcium arsenate spray in second place. These results were obtained in fields where boll weevils were abundant and other insects caused little or no damage. In some plots nearly 80 percent of the squares were infested.

Treatment	Average boll infestation		Average blooms
	On July 8	On July 15, 22,	per acre
	(before poisoning):	29, and	(July 25, Aug-
		August 7	ust 1, and
		(after poisoning):	August 7)
	Percent	Percent	Number
Calcium arsenate dust--:	14.3	8.7	4,448.8
Lead arsenate spray----	14.3	44.9	1,646.6
Calcium arsenate spray--:	15.8	32.5	2,293.6
Untreated check-----:	14.4	59.4	1,151.9

The cotton in these experimental plots has not been picked but the results will be quite different from those obtained in 1939 in a similar series of experiments in the presence of a very light boll weevil infestation in Limestone County. Last year in three experiments lead arsenate applied as a spray at the rate of 2.5 pounds per acre under a pressure of 300 pounds in a machine with three nozzles per row gave an average increase over the untreated cotton of 155 pounds of seed cotton per acre, or 30 percent gain, while adjoining plots dusted with calcium arsenate at the rate of 7 to 8 pounds per acre produced a gain of only 31 pounds, or 6 percent.

PINK BOLLWORM AND THURBERIA WEEVIL CONTROL

Gin-trash inspection.--Toward the end of August, 25 crews were inspecting gin trash in southern Texas and adjacent areas in Mexico. No new areas were found infested in the United States but a light infestation was discovered in Mexico at Nuevo Laredo, in the State of Tamaulipas, this being the first pink bollworms ever found at that point. Generally speaking, the infestation in south Texas seems to be lighter than in 1939. In Cameron County as a whole, infestation built up to about the same degree as last year, but later in the season. In the vicinity of Brownsville, where a comparatively heavy infestation existed in 1939, very few pink bollworms were found. There seemed to be an increase in the infestation in the eastern part of Hidalgo County over last year, but little change in Willacy and Starr Counties. In Duval, Jim Hogg, and Brooks Counties a few specimens were taken, but not as many as last year; however, an increase was found in Maverick County. At the end of August no pink bollworms had been found in Nueces, Jim Wells, and Kleberg Counties; all of which were known to be infested in 1938 and 1939. In the lower Rio Grande Valley of Mexico a much lighter infestation was found in the Matamoros area, but there seemed to be some increase in the Reynosa section. There appeared to be no

particular change in the status of infestation at Anahuac, Nuevo Leon, Mexico.

Subsoil cotton-stalk cutter.--It has been demonstrated that the cost of killing cotton plants in the lower Rio Grande Valley subtropical area, looking to the eradication of the pink bollworm, can be reduced approximately half by the invention by this Division of a subsoil stalk cutter. It is extremely difficult to kill cotton stalks in this area, on account of the tendency of the stubs to sprout and on account of leaving some of the roots of the plant uncut in the plowing operation. This implement is made to be attached to an ordinary two-horse turning plow, to a Georgia-stock, or behind a tractor. It cuts underground at any convenient depth, severing all roots of the plant without otherwise disturbing the ground, leaving the cut-off tap roots well covered with soil. Tests made with this cotton-stalk cutter have shown it to be successful.

Situation in the Big Bend.--Prior to 1938, pink bollworm infestation had built up to such an extent in the Big Bend area that more than half of the cotton crop was being destroyed. A control program put into effect in that area for 1938 and 1939, calling for field clean-up, delayed planting, and elimination of early fruiting sprout cotton, in addition to the usual sanitary measures, combined with flood conditions over large areas the preceding fall, reduced the infestation to such an extent that no commercial damage was present in the 1939 crop. Sufficient observations have been made in 1940 to determine that there will be no commercial damage this year, though this may be partly attributed to weather adverse to pink bollworm development in May 1940.

TRUCK CROP AND GARDEN INSECT INVESTIGATIONS

White-oil emulsion more effective than sulfonated castor oil as spreader for derris-pyrethrum spray against red spider.--C. A. Weigel and George V. Johnson, of the Beltsville, Md., laboratory, reported the results of small-scale toxicity tests against Tetranychus bimaculatus Harv. on potted cucumber seedlings. The tests were designed to determine whether certain spreaders could be substituted for sulfonated castor oil in the derris-pyrethrum-sulfonated castor oil spray without reducing the effectiveness of the spray combination against this pest. The test plants were uniformly treated by spraying both sides of all leaves with a small atomizing electric sprayer held at a distance of 15 feet from the leaves during application. In all derris-pyrethrum spray mixtures tested the concentration was 0.0056 percent of rotenone and 0.01 percent of pyrethrins, while the derris spray alone contained 0.0056 percent of rotenone. All mortality counts of red spiders were made 2 days after treatment. The mortality of red spiders ranged from 71.9 to 100 percent for the 11 spray combinations used in the tests. Both the derris spray and the derris-pyrethrum spray, to which had been added white-oil emulsion, 1-100 by weight, gave 100-percent mortality of the spiders, as compared to 82.2 and 83 percent from derris-pyrethrum sprays to which had been added sulfonated castor oil at the rates of 1-300 and 1-400 by volume, respectively. Water sprays containing only the white oil emulsion at concentrations of 1-100 and 1-200 by weight resulted in mortalities of 97.3 and 92.1 percent, respectively. A derris-pyrethrum spray containing sodium oleyl sulfate 1-1000 by volume gave a mortality of 78.7 percent, while one containing the sodium oleyl

sulfate plus synthetic resins, 1-1,000 by volume, gave 87.6 mortality. Another derris-pyrethrum spray containing sodium lauryl sulfate, 1-3,000 by weight, resulted in a mortality of 71.9 percent. For the same period of observation there was an average mortality of 5.3 percent of the red spiders on untreated cucumber seedlings and 23.3 percent on plants sprayed with plain water. From these results it would appear that the white oil emulsion 1-100 by weight was considerably more effective than sulfonated castor oil 1-300 or 1-400 in the derris-pyrethrum spray. The white-oil emulsion alone, 1-100 or 1-200 by weight, was very effective against the spiders. There was probably little, if any, real difference between the effectiveness of sodium oleyl sulfate 1-1,000 by volume, sodium oleyl sulfate plus synthetic resins 1-1,000 by volume, sodium lauryl sulfate 1-3,000 by weight, and sulfonated castor oil 1-300 or 1-400 by volume, in the rotenone-pyrethrum spray.

Moisture more important than temperature in determining injury to mushrooms from fumigation with hydrocyanic-acid gas.--From experiments designed to control the mushroom and manure flies (*Sciara* and *Megaselia*), A. C. Davis, Beltsville, reports that damage to mushrooms by hydrocyanic-acid gas generated from calcium cyanide is apparently influenced more by moisture than by temperature. To test this the mushroom house was watered and fumigated, using calcium cyanide at a rate of 3 ounces to 1,000 cubic feet. This gave a peak concentration of 0.324 mg./l, resulting in severe burning to the mushrooms. When the house was drier other fumigations at the same dosage resulted in no injury to the mushrooms. During these tests the temperature of the air at the bottom of the mushroom house and of the bottom beds ranged from 51° to 55° F., while temperature in the top beds of mushrooms and at the top of the house ranged from 54° to 61°. Even with the range in temperature of 51° to 61°, no difference in the effect of the gas upon mushrooms could be detected between the top and bottom beds. Therefore it would appear that the more important factor in determining damage to the mushrooms during fumigation is moisture, rather than temperature.

Serpentine leaf miner in gerbera controlled with methyl bromide.--A series of experiments conducted by F. S. Blanton, of the Babylon, N. Y., laboratory, has shown methyl bromide to be an effective fumigant against *Agromyza pusilla* (Meig.) attacking many varieties of gerbera. In preliminary tests 100-percent mortality of the leaf miner larvae was obtained by exposing infested leaves of gerbera to concentrations of 2 pounds per 1,000 cubic feet for a period of 2 hours or 3/4 pound per 1,000 cubic feet for 4 hours, with the temperature about or slightly above 70° F. At the same temperature practically 100-percent mortality of the larvae was obtained by exposing the infested leaves for 12 hours to concentrations of 1/4 or 5/16 pound of methyl bromide per 1,000 cubic feet. Other tests made so as to approximate commercial application of this fumigant disclosed that concentrations as low as 5/16 pound of the methyl bromide per 1,000 cubic feet, with an exposure of 12 hours, gave 100-percent mortality of the larvae infesting leaves that were tightly packed together in the bottom tray of the fumigator. Similar concentrations of this fumigant were equally effective against the eggs of the leaf miner. Little is known concerning the tolerance of gerbera plants to this fumigant, but it appears that the gas may be used effectively at the time of transplanting.

Infestation of cane maggot in youngberries and loganberries.--

W. W. Baker and S. E. Crumb, Jr., of the Puyallup, Wash., laboratory, report having observed during June an unusual infestation of a cane maggot, Phorbia sp., in youngberries and loganberries in the Horsehead Bay district, Pierce County, Wash. Typical damage by the cane borer Phorbia rubrivosa Coq. is considered to appear first when the young cane shoots are about 12 to 18 inches tall and is usually consummated about June 1. In the Horsehead Bay area examination of the infestation disclosed not only the presence of pupae as would be expected in the case of P. rubrivosa, but also larvae of varying ages, some quite small. The points of injury on the canes indicated that the flies had been active for several weeks, beginning perhaps about the middle of April or soon after. In a short row of youngberries the flies had apparently not killed as many shoots as in the loganberries, but had galled a number of the youngberries from 5 to 8 inches above the soil surface. In the loganberries these galls were from 1 to 3 feet above the soil and the wilted tips were more prevalent on this plant than on youngberries. Another unusual feature, the loganberries had as many as three infestations on individual plants. An inspection of nearby native berry host plants and a few escaped evergreen blackberries failed to disclose a single one infested. Records indicated that this apparently localized infestation had persisted for about 8 or 9 years, despite attempts to control it by carefully pruning the berries and although there seemed to be no reservoir of native plants close by to supply flies each year. However, neglected fields may supply these flies if their flight range is considerable. Investigations are now being made to determine the species of Phorbia responsible for the damage.

Tobacco plants injured by poisoned baits.--Tests conducted by F. S. Chamberlin, of the Quincy, Fla., laboratory, to determine the severity of plant injury caused by several poisoned baits when applied to tobacco in plant beds, disclosed that foliage burn resulting from a bait containing calcium arsenate was much less than that from one containing an equal amount of paris green. The formula used consisted of 5 pounds cottonseed meal, 5 pounds wheat bran, 2 quarts molasses and water (1-10), and $\frac{1}{2}$ pound calcium arsenate or paris green. Similar comparisons with a bait containing $\frac{1}{2}$ pound of paris green and $\frac{1}{2}$ pound of hydrated lime showed that less injury resulted from the application of this bait than that from the one containing the paris green only, but more than that from the one containing calcium arsenate.

INSECTS AFFECTING MAN AND ANIMALS

Combination screwworm larvicides and wound protectors.--Approximately 50 remedies combining both larvicidal and wound-protective properties were tested during the month by Roy Melvin and C. L. Smith, of the Menard, Tex., laboratory. Of these, 12 have given very promising results in incomplected preliminary field tests. Three remedies gave 5 days' initial protection, 5 gave 6 days' protection, 2 gave 7 days' protection, 1 gave 8 days' protection, and 1 gave 9 days' protection on large bloody cattle wounds against all species of flies.

Egg-laying habits of Tabanus abactor.--W. L. Barrett, Jr., of the Uvalde, Tex., laboratory, while commenting on the fact that the egg-laying

habits of T. abactor Phil. are unknown, states that he has observed for the second time that the eggs were laid in a loose mass and fell apart single when disturbed. The eggs were not stuck together in the typical type of the Tabanus spp. cluster. Mr. Barrett obtained the eggs from one of seven females placed in a screen-wire cage in which was placed a piece of moist cotton. They were oviposited under the cotton.

Amount of blood engorged by horn flies.--Interesting data on the average amount of blood taken by individual flies, Haematobia irritans L., and the total amount of blood lost by a herd of cattle because of these flies, were submitted by W. G. Bruce, of the Dallas, Tex., laboratory. It was found that an average meal of blood of each horn fly was from 1.04 to 2.19 mg. and that 2 meals were taken daily. Using these data, Mr. Bruce estimated that on 1 ranch near Cresson, Tex., where there are 500 head of cattle with a normal infestation of approximately 4,000 horn flies per head, 7 quarts of blood were lost daily. At that rate, a rough estimate would be 312 gallons, or 2,713 pounds of blood lost in a year's time by this herd of cattle.

Trapping horn flies.--Data obtained by Mr. Bruce indicate a marked reduction in number of horn flies where cattle fly traps have been installed. Cattle in a trapped pasture averaged 100 flies per head, whereas cattle in untrapped pastures averaged over 1,000 flies per head. The percentage of each species of flies, as determined by a sample of 500 flies taken from a cattle fly trap, was as follows:

<u>Species</u>	<u>Percent</u>
<u>Haematobia irritans</u> L-----	96.6
<u>Stomoxys calcitrans</u> (L.)-----	1.4
<u>Sarcophaga</u> spp-----	.6
<u>Cochliomyia macellaria</u> (F.)---	.8
<u>Lucilia</u> spp-----	.2
<u>Cryptolucilia</u> spp-----	.4

Developmental periods of sand flies.--J. B. Hull, of the St. Lucie, Fla., laboratory, states that the developmental period of sand flies, Culicoides furens Poey, was found to range from 30 to 148 days.

Flight range of sand flies.--A light trap set up by Mr. Hull $4\frac{1}{2}$ miles from a sand fly breeding place failed to attract any sand flies.

Breeding places of dog fly.--W. E. Dove, of the Panama City, Fla., laboratory, reports that extensive and intensive observations by five men in August show that the dog fly, Stomoxys calcitrans, breeds primarily in fermenting marine grasses, Halodule and Thalassia, deposited by tides on the bays.

Mosquito larvicides.--According to latest tests on mosquito larvicides by W. V. King, Orlando, Fla.; phenothiazine in penetrol and acetone was more toxic to Culex pupae than other combinations of wetting agents with phenothiazine. Also, phenothiazine appeared more toxic than the promising Azo compounds when used on Aegypti larvae.

Mosquito survey in Yakima Valley.--At the request of health officers and sanitary engineers in and around Yakima, Wash., E. F. Knipling and C. M. Gjullin made a survey of the mosquito situation late in August to determine the status of the mosquito species at that point. The species taken included Aedes vexans Meig., A. lateralis Meig., A. dorsalis Meig., Culex pipiens Linn., C. tarsalis Coq., Theobaldia inornata Will., and Anopheles maculipennis Meig. The request was prompted by the alarming number of cases of human encephalitis. A total of 41 cases in man, resulting in 9 deaths, have been reported in that area this season. The number of cases of equine encephalomyelitis has been relatively low, however. As only 12 such cases have been reported in horses, the low incidence is probably due largely to an intensive number of inoculations.

FOREIGN PLANT QUARANTINES

Excess airplane passengers.--More than one hundred excess passengers in the form of fruitflies were found on August 13 at New York when Customs Inspector Adams called attention to a paper carton of fruit among the baggage from the seaplane Dixie Clipper. The fruit left from a basketful sent aboard at the Azores as a present to one of the passengers, consisted of 143 figs from which 119 live larvae of Ceratitis capitata (Wied.) were taken, 4 pounds of grapes from which 2 larvae were taken, 75 Passiflora edulis, 2 pineapples, and 96 plums. Part of the passion fruit was infected with a fungus tentatively determined as Phoma sp.

Avocado disease.--An avocado from Nicaragua, found in a ship's quarters at New Orleans on August 23, bore small groups of tiny protuberances, some of which had blackish specks on or near their tops. Microscopic examination disclosed that the specks were due to a Cercospora sp., probably undescribed, which was sporulating abundantly. Very few of the lesions were sufficiently mature to sporulate. It is probable that this disease has been intercepted before in the immature state. The Cercospora sp. reported on Florida avocado leaves might be the same species. Additional material of this form on the fruit is desired for study by the specialists.

New nematodes described.--The Proceedings of the Helminthological Society of Washington for July (received in September) contains two papers by Jonas L. Bassen, inspector at New York, entitled, "Rhabditis chitwoodi, n. sp., a Nematode Found in Diseased Sagittaria Corms, with Remarks on Rhabditis conica (Reiter) n. comb." (Helminthol. Soc. Wash. Proc. 7:98-101, July 1940) and, "Panagrolaimus hygrophilus, n. sp., a Nematode Found in Decayed Tubers of the Waterlily Root, Nelumbium nucifera Gaertn." (ibid. 7:101-3). The new species of Rhabditis was found in Sagittaria corms (from Wisconsin) being inspected for export certification. The Panagrolaimus was found in an internal wet rot of waterlily roots in cargo from Cuba.

Entomological interceptions of interest.--Carnation flowers found on August 2, 1940, in crew's quarters of the S. S. Exochorda from Europe at New York, were infested with the thrips Haplothrips cotei (Vuillet). This represents our first interception of this species, which is a pest of carnations in Egypt and southern France. Four living adults of the mango weevil (Sternochetus mangiferae (F.)) were intercepted at San Pedro, Calif., on

July 8 in mango seed in baggage from Hawaii. Living larvae and pupae of the West Indian sweetpotato weevil (Euscepes postfasciatus (Fairm.)) were found at Baltimore, Md., in sweetpotato in stores on July 26 from the Virgin Islands. Specimens of the coccid Asterolecanium aureum (Bdv.) were taken at Hoboken, N. J., on August 20 on a leaf of Cattleya sp. in cargo from Venezuela. Fifty-three living larvae and one pupa of the pink bollworm (Pectinophora gossypiella (Saund.)) were intercepted at Philadelphia, Pa., on July 25 in cotton bolls in mail from Argentina. Living specimens of the mirid Sixeonotus areolatus Kngt. were found at Eagle Pass., Tex., on July 11 on lettuce in baggage from Mexico. A living specimen of the lygaeid Clerada apicornis Sign. was intercepted at Hoboken, N. J., on July 13 on wild Cattleya sp. in cargo from Colombia. Specimens of the coffee-berry borer (Stephanoderes hampei Ferr.) were taken in coffee berries at New York on July 11 in cargo from Angola and on July 15 in cargo from Ethiopia. The coccid Matsucoccus matsumurae (Kuw.) was intercepted in passenger's baggage at Seattle, Wash., on April 29, 1940, on dwarf pine plants from Japan arriving on the Hikawa Maru. Two living and one dead specimens of the cerambycid Penichroa fasciata Steph. were found at New York on July 19 in wooden hoops on a barrel in cargo from Spain. A living adult and pupa of the cerambycid Phormesium virgulatum Bates were intercepted at New Orleans, La., on July 5 in Cassia fistula seed pod in baggage from Honduras. Six living adults of the scolytid Leperisinus fraxini (Panz.) were found at New York on August 2 under the bark of ash wood used as crating in cargo from England.

Pathological interceptions of interest.--Citrus canker (Bacterium citri (Hesse) Doidge) was taken on July 5 at Boston on sour limes in stores from Java. It is stated that half of the 143 fruits were infected. Ceratophorum setosum Kirchner was intercepted July 30 and again on August 8 at New York on Erythroxylon coca leaves in cargo from Peru. Colletotrichum orchidearum All. was intercepted on Dendrobium chrysotoxum from Thailand on February 6, on Fernandezia (Lockhartia) lutea from Guatemala on February 28, and on Trichopilia tortilis from Mexico on March 12, all on plants offered for entry under special permit at San Francisco. Didymosporium sp. was found on May 29 at Washington on Dombeya sp. in a special-permit mail shipment from Cuba. Gloeosporium sp., no species reported on the host genus, was found on February 28 at San Francisco on Trichopilia tortilis plants in cargo from Guatemala. Graphiola sp. (cf. G. cylindrospora) was found on July 15 at Philadelphia on palm leaf packing for palm leaf fans from China. Melampsora medusae Thuem. (inadequate material and determination somewhat doubtful) was found on February 7 at New York on 3 Populus sp. leaves in the excelsior packing for nectarines in cargo from Chile. Mycosphaerella sp. (spores too short for M. caricae Syd.) was found on January 10 at New York on papaya fruits in stores from Cuba. Phyllosticta sp. (cf. P. allii Tehon and Daniels) was taken August 3 at El Paso on onion bulbs in baggage from Mexico. Phyllosticta sp., no species reported on the host, was found on April 10 at New York on Lawsonia inermis leaves in cargo from Anglo-Egyptian Sudan. Phyllosticta sp., which does not agree with any described species, was found at New York on December 29, 1939 on Fraxinus ornus seed from Italy. Puccinia urbaniana P. Henn. was found on Valerianodes jamaicensis leaves in baggage from Puerto Rico on August 12 at New York. A Puccinia sp. which does not agree with either P. phragmitis (Schum.) Korn. or P. magnusiana Korn. was taken on June 22 at Nogales on Phragmites communis among wild grasses in cargo from Mexico.

DOMESTIC PLANT QUARANTINES

Grasshopper and Mormon cricket control work.--Adult surveys in both the grasshopper and Mormon cricket infested areas were completed in August and the egg surveys of the crickets were practically finished by the close of the month. In preparation for the survey of grasshopper eggs, schools of instruction for control supervisors are scheduled as follows: Great Falls, Mont., August 30-31; Fargo, N. Dak., September 5-6; Yankton, S. Dak., September 12-13; Lamar, Colo., September 17-18. There were no Bureau-paid control operations in August, all such work having been terminated late in July. Farmer baiting in most of the crop-'hopper areas had ceased by the close of August. In some areas where infestations of nymphs of the lesser migratory 'hoppers are expected in young wheat, the mixing stations are continuing operations. Control measures were still going forward at the close of August in several counties in Utah where an excellent outlook for alfalfa seed is encouraging the growers to continue baiting and in the northern Red River Valley of Minnesota where continued sporadic local migrations occur. Completion of work in Crook and Sheridan Counties, Wyo., in the week ended August 10 wound up the season's control work in the Mormon cricket infested States.

Governor appoints white-fringed beetle control committee.--To consider the problems of white-fringed beetle control in the vicinity of New Orleans, a conference was held with the Governor of the State on August 9, attended by beekeepers and certain others affected by the operations and by State and Federal representatives. The Governor later appointed a committee to study the activities of the control program.

White-fringed beetle quarantine restrictions modified.--Intensive control work on the white-fringed beetle infestations during the last few years have so reduced beetle populations that the Federal quarantine regulations have been further modified to lift all restrictions on the movement from any part of the regulated area of cotton lint, baled or unbaled, and also on cottonseed when free from gin trash. Sanitation practices at the cotton gins are required to be maintained. This modification was made effective August 9, 1940, by a revision of circular B. E. P. Q. 485.

Sweetpotato weevil inspection in Louisiana.--At the request of the Louisiana State entomologist, a cooperative survey of the sweetpotato weevil is being made in northern Louisiana. Considerable assistance is being given by the county agents in locating the areas in which sweetpotatoes are grown more extensively. A similar survey was conducted several years ago in this part of the State without finding sweetpotato weevils.

Phony peach and peach mosaic inspection.--Phony peach and peach mosaic inspection was rapidly nearing completion for the current year in most areas during August. Inspections were conducted in Alabama, Arkansas, California, Colorado, Georgia, Louisiana, New Mexico, Mississippi, South Carolina, Texas, and one small area in Utah. During the latter part of the month predefoliation inspections of nursery stock were begun in the mosaic infected States in accordance with the provisions of the standard State quarantines.

Peach mosaic work in Arizona.--All mosaic infected trees have been removed from the Beaver Creek District in Yavapai County, and a considerable number of new orchards are being planted in the district. The cooperation of growers in Arizona is constantly improving and should greatly increase the effectiveness of control operations.

Citrus canker eradication.--Operations on the citrus canker eradication project were limited during August to inspection work. Five Bureau inspectors examined dooryard trees in the towns of Pharr, San Benito, and Mission, Tex., as part of a precautionary resurvey of the old plantings throughout the lower Rio Grande Valley, where the canker appeared in the early stages of eradication operations. No infection has been discovered in the valley since 1922. Over 14,000 trees on 1,300 properties were inspected in August.

Transit-inspection activities.--The movement of produce cars from the area of heavy flight in the Japanese beetle regulated area to midwestern points dropped off considerably in August, as evidenced by the number of cars inspected in Chicago, which fell from a total of 192 in July to 29 in August. The inspector at Boston made an interception of plants in soil in a package labeled "flowers" moving in violation of both the Japanese beetle and gypsy moth quarantines. At Philadelphia inspection was made of a shipment of scrap iron moving from New Orleans by boat.

Railroad cooperation.--The excellent cooperation received from freight representatives by the inspector at Atlanta is worthy of special comment. These railroad officials have requested their employees to place on the train sheets the numbers of Federal certificates covering shipments of quarantined articles and to make available to the inspector the "passing records" of carlots of freight moving through Atlanta. This enables the inspector to make a quick and efficient check of an enormous amount of material moving via freight in carload lots.

CONTROL INVESTIGATIONS

Toxicity and repellency of paris green affected by particle size.--E. R. McGovern and E. L. Mayer, of this Division, and C. C. Cassil, of the Division of Insecticide Investigations, report that the toxicity and repellency of paris green to the Mexican bean beetle is influenced by the particle size of the insecticide. Mr. Cassil, who prepared the three fractions of paris green, removed the fine particles from the coarser fractions by controlled sedimentation and decantation in ethyl alcohol after these fractions had first been separated by the usual sieving procedure. Most insecticidal dusts, even when considered to be coarse, contain considerable fine material which probably has a marked effect on their toxicity. The finest fraction was separated out by a Federal air classifier. Under field conditions paris green is very toxic to bean foliage but under the laboratory conditions of these tests, where spray and dusts were applied only to the upper surface of the leaves and the spray dried in 5 minutes or less, no appreciable injury became evident during the 48 hours the beetles were allowed to feed on the treated foliage. These laboratory tests showed that paris green particles with an average diameter of 1.1 microns caused the highest mortality among the insects and permitted the least feeding, when

applied to bean foliage either as a spray or a dust. The 12 micron particles caused an intermediate percentage of mortality and degree of feeding and the 22 micron fraction caused the lowest mortality and permitted the largest amount of feeding.

INSECTICIDE INVESTIGATIONS

Variations in melting point of toxicarol.--An interesting observation on the melting point of toxicarol, a constituent of several types of derris, has been made by H. A. Jones and J. W. Wood. This compound can be obtained in two isomeric forms known as alpha and beta. The former is the higher melting form and the one usually isolated from derris. Values obtained by previous investigators for the melting point of alpha-toxicarol have shown considerable variance. Jones and Wood have now found that the type of glass from which the capillary melting-point tubes are made has a marked effect on the value obtained. In ordinary soft glass the melting point may be about 20° lower than in Pyrex and in one type of soft glass it was found to be over 30° lower than in Pyrex. The glasses causing a lowering of the melting point have been found to be more alkaline than Pyrex, that causing the greatest lowering being the most alkaline of the group tested. As alpha-toxicarol is changed by alkali to the beta form, it is undoubtedly this factor which causes the observed lowering. It is therefore essential to use Pyrex or similar glass of low alkalinity for determining melting points of this material. This discovery may have wide application in the determination of this important property as many other compounds may be expected to show similar differences.

BEE CULTURE

American foulbrood in larvae produced by small number of spores of Bacillus larvae White.--A. W. Woodrow, Laramie, Wyo., reports as follows concerning controlled inoculation of individual honeybee larvae resulting in American foulbrood infection: "Larvae of known age are obtained by confining the queen on a clean brood comb for about 1 day in a perforated zinc cage. After hatching, larvae of known age are inoculated by introducing spores of B. larvae in water suspension to the royal jelly on which the larvae are feeding by means of a hypodermic syringe, each larva receiving about 1/5,000 cc. of the spore suspension. The comb containing the inoculated larvae is then placed in the broodnest of a healthy colony for completion of the larval-feeding period. After the brood is sealed the comb is enclosed in a wire-cloth cage to prevent the bees from removing any brood that might become diseased. Just prior to the time of emergence the brood is examined to determine the infection produced by the inoculations. Based on dilutions of the original suspension, in which the spore content has been calculated to be approximately 500,000,000 per cc., larvae may be infected by an extremely small number of spores. In the brood of 14 combs inoculated with 1 dilution preparation, the average proportions of infected larvae produced by various calculated numbers of spores were: 1 spore, 17.8 percent; 2 spores, 23.4 percent; 5 spores, 51.1 percent; 10 spores, 68.6 percent; 25 spores, 81.1 percent; 50 spores, 84.1 percent. Improvements in technique have resulted in higher proportions of infected larvae for those given 50 spores than were obtained earlier with larger numbers of spores, even up to 100,000 per larva. Fifty spores, or more, have produced 100-percent infection in some experiments, but no suspension has produced



this proportion in all experiments, probably because of difficulties in inoculation technique. Infection has been produced only in larvae inoculated within 2 days after hatching of the eggs. Inoculation of larvae less than 1 day old produces a much higher proportion of infection than inoculation of larvae 1 to 2 days old. Brood from 'resistant' colonies inoculated by this method becomes infected to about the same extent as that from 'susceptible' colonies."

Incense-cedar honeydew.--Ger. H. Vansell, Davis, Calif., reports: "A heavy population of the 1940 brood of Xylococcus macrocarpa Cole. is present at the 4,000-foot level in Eldorado County. These young individuals are now producing an increasing steady supply of honeydew. The exudate appears in small drops at the distal end of a waxy tube projecting from under the scales of tree bark. In spite of the apparent colorless nature of these drops, the honey in the combs has a distinct amber tinge. An occasional yield of white honey is reported but continued observations for a number of years have failed to reveal a colorless honey known to be from incense cedar."

IDENTIFICATION AND CLASSIFICATION OF INSECTS

Nevermann collection of Central American Coleoptera acquired.--The collection of Central American Coleoptera assembled by the late Ferdinand Nevermann, of San Jose, Costa Rica, has recently been obtained by the Bureau and is now available to the specialists on Coleoptera in this Division. It contains approximately 33,000 specimens, representing 2,800 named species, and in addition about 10,000 unidentified beetles. Types, cotypes, or paratypes of nearly 400 species are included. This collection will be of much assistance to the Division, because Central American species of Coleoptera have been poorly represented among the available reference material.

California record for an introduced ant.--Specimens of the introduced greenhouse ant Pheidole anastasi var. cellarum Forel were recently received from V. E. Williams, of Los Angeles County, Calif., with the statement that the ants were infesting a nursery in west Los Angeles. Although this ant is often encountered in greenhouses in the Eastern States, this is apparently the first time it has been noted in California.

Identification of a thrips on carnations from Europe.--Adults and nymphs of what appears to be Haplothrips cotei (Vuillet) were taken by the Division of Foreign Plant Quarantines at New York from flowers of carnations found in quarters of the S. S. Exochordia arriving from Europe on August 2. The exact point of origin could not be ascertained. This species of thrips is not known to occur in the United States and has not previously been intercepted by quarantine officers of the Bureau. It was described in 1913 from the vicinity of Marseille, France, as deforming the buds of carnations and was later recorded from Egypt as a pest of the same flower.